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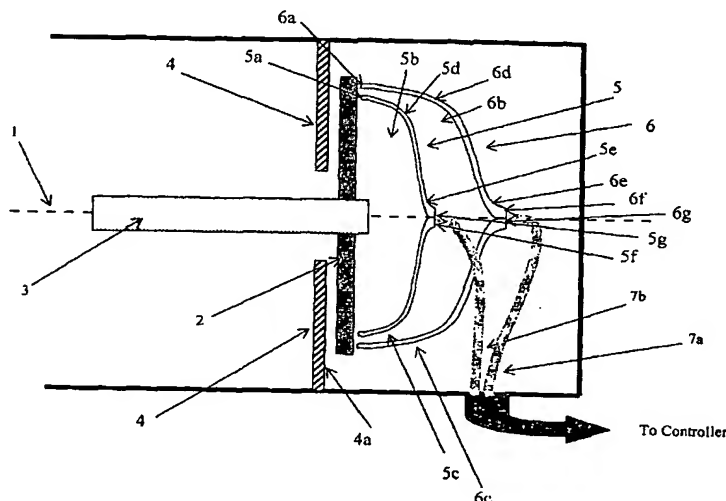
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- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

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(54) Title: OPTICAL ENCODER WITH CYLINDRICAL LIGHT GUIDE



(57) Abstract: An optical encoder assembly and a method for measuring a rotation angle in which optical beams are spread over the circumference of a rotating optical disk by means of optical guides (OG). In the preferred embodiment the rotating optical disk has a pair of concentrically arranged circular patterns with alternating transparent and opaque sections. Each beam is input via optical fibers to one of a pair of concentrically disposed OGs with a cylindrical shape (COGs) respectively and propagated through the optical disk to be reflected by a mirror with two concentrically disposed circular patterns of reflective and non reflective sections, reentering the COG through the optical disk in a reverse direction. The COGs then guide the light beams back to an electronic interface that converts the optical signals into electronic signals producing position information. Considerably elevated precision can be obtained due to the averaging of the light intensity going through the disk on a substantially large part of the optical disk.

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INTERNATIONAL SEARCH REPORT

Internat. Application No
PCT/IL2004/000042

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01D5/347 G01D5/38 G02B6/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01D G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 054 938 A (NAKASHIMA TOSHIRO ET AL) 25 April 2000 (2000-04-25) column 1, line 4 - column 2, line 9 column 5, line 25 - line 44 figure 8 claims 1-3	1, 4, 5, 9-13, 20
X	DE 21 55 970 A (DUNLOP HOLDINGS LTD) 10 August 1972 (1972-08-10)	1, 2, 4, 5, 9-13, 15-22
Y	page 3, paragraph 4 - page 4, paragraph 2 page 4, paragraph 4 - page 6, paragraph 1 page 8, paragraph 3 - paragraph 5 claims 1-5, 7, 8, 12, 14 figures 5-8	3, 6-8, 14

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
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- *&* document member of the same patent family

Date of the actual completion of the international search

13 January 2005

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International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 31 33 401 A (ASEA AB) 1 July 1982 (1982-07-01) page 5, paragraph 2 page 6, paragraph 3 page 7, paragraph 1 - page 9, paragraph 1 page 10, paragraphs 2,3 figures 1,2,4,5 claims 1-7	10-13
A	EP 0 646 796 B (PHILIPS ELECTRONICS NV) 8 December 1999 (1999-12-08) paragraphs '0009!', '0023!', '0030!', '3136!' - '0039!', '0056!' - '0064!', '0069!', '0075!', '0094! claims 1,2,4,8,9,11-13,15 figures 2-5,7,8	1-22
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A	column 2, line 14 - column 5, line 46 claims 1-3 figures 1,2	1,2,4,5, 9-13, 15-22
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X	US 2003/108295 A1 (HUANG GUANGHUA) 12 June 2003 (2003-06-12)	23-26
Y	paragraphs '0008!', '0021!', '0022!', '0030!', '0032! claims 1,5,9,18,25,26,33,34,36	23-28
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INTERNATIONAL SEARCH REPORT

Internat

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 201 527 A (PA CONSULTING SERVICES) 1 September 1988 (1988-09-01) figure 1	23-28
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INTERNATIONAL SEARCH REPORT

In - onal application No.
PCT/IL2004/000042

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

As a result of the prior review under R. 40.2(e) PCT,
no additional fees are to be refunded.

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☒ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-22

A method for measuring a rotation angle by an optical encoder assembly and corresponding optical encoder.

2. claims: 23-28

An optical guide.

INTERNATIONAL SEARCH REPORT

information on patent family members

Intern:

Application No

PCT/IL2004/000042

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